

Technical Note – No. 20

Measuring the Noise Figure of Diode Laser Current Sources in the μA Level

Low noise diode laser current sources are essential for the application of diode laser systems in the field of spectroscopy. Therefore, we have developed a method for measuring the noise figure of our laser drivers with a resolution of $5\mu\text{A}$ at a current level of 100mA and more.

Problems with conventional laser current measurement

The problem with a direct measurement of the noise level of the laser driver current suffers at the low noise signal of below $5\mu\text{A}$ at typical current values of 100mA up to 2A . When measuring the laser current via the voltage at a reference resistor, there is a high DC-signal level of several Volts which does not allow to resolve the noise signal with a sufficient resolution in the sub mV range. Therefore, Sacher Lasertechnik has developed a method to overcome this problem.

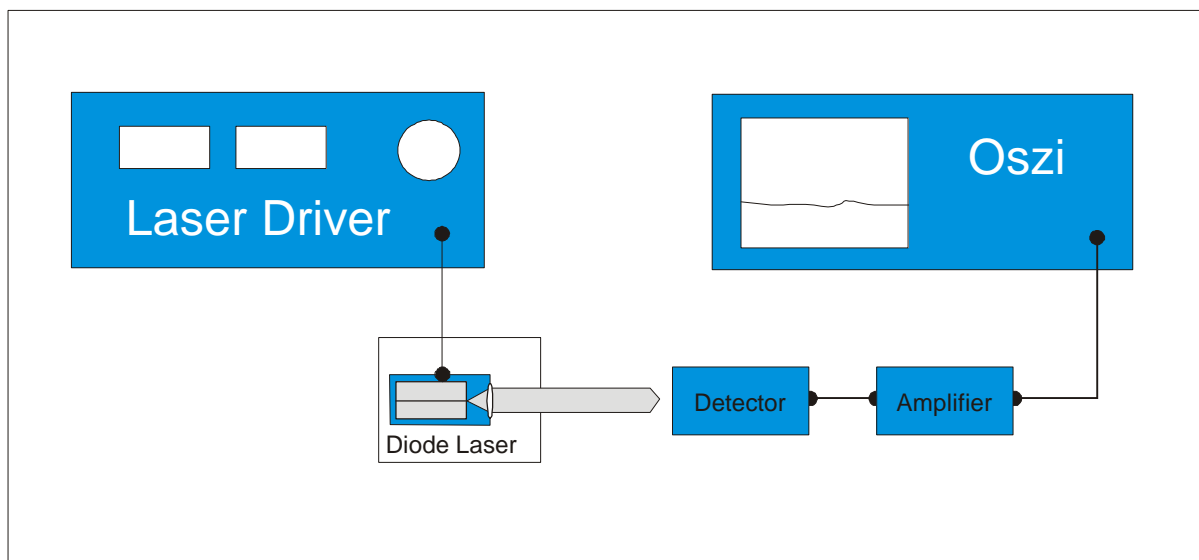


Figure 1: Schematic setup for measuring the noise level of diode laser drivers

Description of the Sacher Lasertechnik method of characterizing the noise level of laser current sources

We use an indirect way of measuring and characterizing the noise level of our laser current sources. We operate a diode laser with our laser drivers. The laser emission is detected with a Si photodiode. Its electrical signal is amplified and monitored via a TEK 1002 60MHz oscilloscope.

Document: <http://data.sacher-laser.com/techdocs/noise01.pdf>

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Results of Sacher laser drivers in comparison with other products

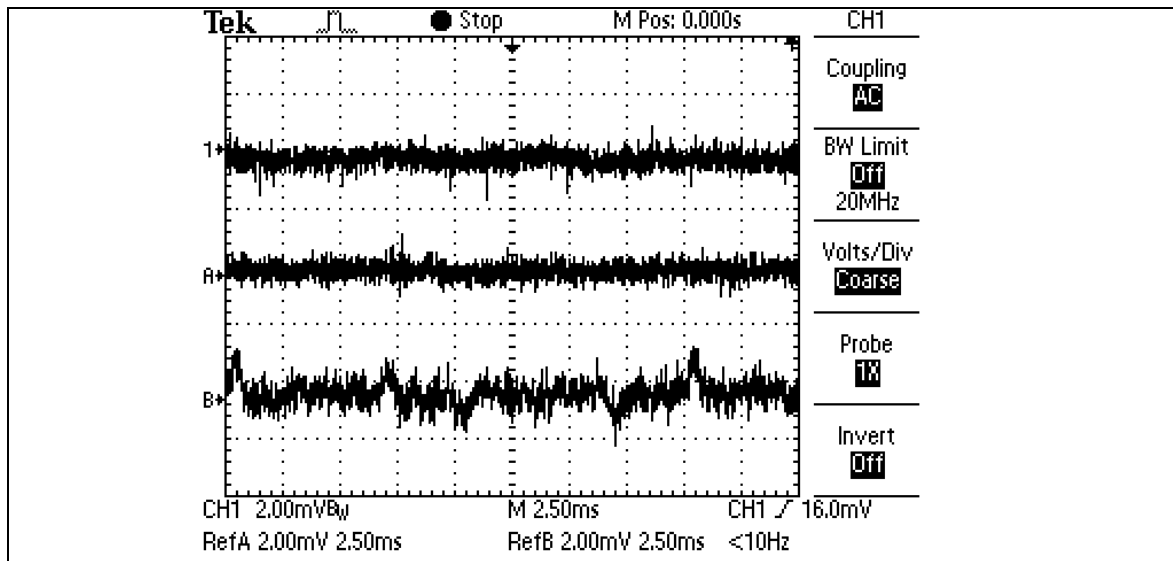


Figure 2 : Results of the noise measurement with the oscilloscope in Sample Mode.

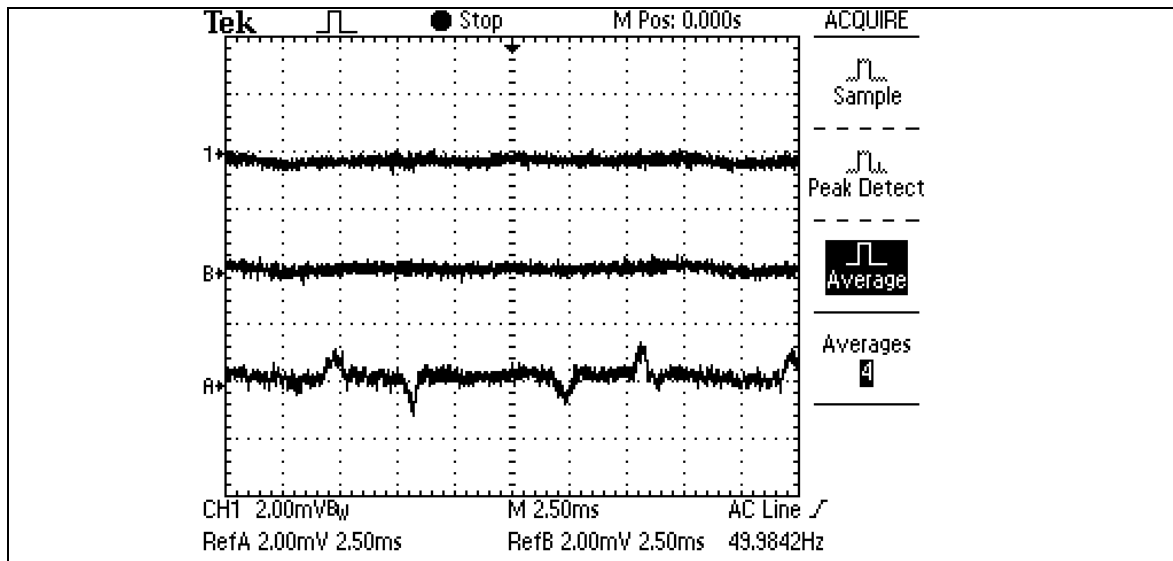


Figure 3 : Results of the noise measurement with the oscilloscope in Average Mode.

Trace 1 of Figure 2 and 3 shows the reference signal with no laser operation. Trace 2 shows the noise figure of the Sacher Lasertechnik MLD-1000 laser driver. Trace 3 shows the signal of the 2000mA commercial available laser driver as comparison. In summary, the Sacher Lasertechnik MLD-1000 laser driver operates with a noise figure below 5µA on a frequency scale from DC to 60MHz.

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